NASA Procedural Requirements

COMPLIANCE IS MANDATORY

NPR 8715.3C
Effective Date: March 12, 2008
Expiration Date: March 12, 2013

Printable Format (PDF)

Request Notification of Change (NASA Only)

Subject: NASA General Safety Program Requirements (w/Change 7 dated 2/25/11)

Responsible Office: Office of Safety and Mission Assurance

| TOC | ChangeLog | Preface | Chapter1 | Chapter2 | Chapter3 | Chapter4 | Chapter5 | Chapter6 | Chapter7 | Chapter8 | Chapter9 | Chapter10 | Chapter11 | AppendixA | AppendixB | AppendixC | AppendixD | AppendixE | AppendixF | AppendixG | AppendixH | AppendixI | ALL |

CHAPTER 3. Operational Safety

3.1 Purpose and Objectives

This chapter establishes safety procedural requirements for NASA operational safety. The objective of this chapter is to protect the public; flight, ground, laboratory, and underwater personnel; the environment; aircraft; spacecraft; payloads; facilities; property; and equipment from operations-related safety hazards. This NPR is not inclusive of all regulations and requirements governing operations. Citations are indicated throughout the text for applicable standards, specifications, and other references.

3.1 NASA has established an Engineering and Construction Innovations Committee to nurture and foster the identification and appropriate use of new innovations and practices to improve the process of delivering high quality facilities projects. Each Center or off-site facility with responsibility for construction projects has one member/vote on the Engineering and Construction Innovations Committee.

3.1.1 Center Directors shall conduct safety inspections of all facilities, occupied or unoccupied, at least annually to ensure compliance with safety, fire protection, and building codes and standards (Requirement).

3.2 Motor Vehicle Safety

3.2.1 Center Directors shall ensure that motor vehicle operating procedures comply with

Federal, State, and local motor vehicle safety regulations (Requirement 25139) .

3.2.2 Motor Vehicle Operation

Note: Motor vehicles include electric utility cars.

3.2.2.1 Operators of motor vehicles on NASA property or operating a NASA vehicle both on and off NASA property shall:

a. Not drive a motor vehicle for a continuous period of more than 10 hours, including a combination of personal driving and driving for official NASA business (Requirement).

b. Not drive a motor vehicle for a combined duty period that exceeds 12 hours in any 24-hour period, without at least 8 consecutive hours of rest (Requirement 32269) .

c. Not use hand-held communication devices while the vehicle is motion except for emergency, security, and fire vehicles during official operations (Requirement).

Note: This includes cell phones, UHF radios, or other hand-held wireless communication devices. When there are two individuals traveling in an emergency, security, or fire vehicle during official operations, the passenger should be the person to use the hand-held communication device.

d. Ensure that children unable to use seat belts while in Federal vehicles are secured in DOT-approved child safety seats that are properly installed (Requirement 32276) .

e. Have formal training, as required in paragraph 7.3.1 of this NPR, if operation of the vehicle involves skills beyond those associated with normal, everyday operation of private motor vehicles (Requirement).

3.2.2.2 Center Directors shall ensure that any variation from the above policy has safety office approval (Requirement 32270) .

3.2.2.3 Center Directors shall ensure that all NASA motor vehicles used off NASA Centers are inspected to the standards of the State or other jurisdiction's vehicle safety inspection requirements (Requirement 32273) .

3.2.3 Seat Belts Executive Order 13043, Increasing Seat Belt Use in the United States, dated April 16, 1997, as amended, requires all Federal employees to use seat belts while on official business. The EO states seat belt use is required by Federal employees operating or in any vehicle with seat belts while on Federal business.

3.2.3.1 Center Directors shall ensure that:

a. Center policy requires passengers not be carried in the cargo area of pickup trucks, flatbeds, or special purpose equipment such as fire trucks or escape trucks unless designated occupant positions with seat belts are provided (see 49 CFR Part 571, Federal Motor Vehicle Safety Standards) (Requirement 32277) .

b. Center policy requires the use of seats belts for all occupants of motor vehicles operated on NASA property, including delivery vans and trucks of all sizes, at all times the vehicle is in motion (Requirement 32278) .

3.2.4 Annual Seat Belt Report

3.2.4.1 Director, Safety and Assurance Requirements Division, shall:

a. Prepare and submit an annual status report to the Secretary of Transportation on NASA-wide seat belt use (Requirement 32280) .

Note: Required by EO 13043, Increasing Seat Belt Use in the United States, dated April 18, 1997, as amended. The annual report includes seat belt usage rates and statistics of crashes, injuries, and related costs involving Federal employees on official business. DOT consolidates this data into an annual status report to the President for all Federal Agencies.

b. Coordinate data for the annual report with the Office of Institutions and Management and the OCHMO (Requirement).

Note: The format and submittal date for the report will be as directed each year by the Secretary of Transportation.

3.2.5 Traffic Control Devices and Markings

3.2.5.1 Center Directors shall use the ANSI D6.1, Manual on Uniform Traffic Control Devices for Streets and Highways, for guidance when setting traffic control devices or marking roads for motor vehicle operations on NASA property (Requirement 25142) .

3.3 Personal Protective Equipment (PPE)

3.3.1 Requirements for the stocking and issuance of PPE are provided in NPR 4100.1, NASA Materials Inventory Management Manual.

3.3.2 Requirements for the accountability of PPE are provided in NPR 4200.1, NASA Equipment Management Manual.

3.3.3 Requirements for the use, including the training for, storage, and maintenance, of PPE are provided in 29 CFR Part 1910, Subpart I, Personnel Protective Equipment.

3.3.4 Examples of PPE. Items which may be purchased and issued by NASA include, but are not limited to, the following:

a. Safety goggles and safety spectacles (plain and prescription).

b. Welding helmets and shields.

c. Safety shoes.

d. Steel sole and/or toe safety boots.

e. Aprons, suits, and gloves (e.g., fire resistant materials, leather, rubber, cotton, and synthetics).

f. Protective head gear (e.g., hard hats and caps, liners, helmets, and hoods).

g. Face shields.

h. Specialty items of protective nature (e.g., cryogenic handlers suits, Self-Contained Atmospheric Protective Ensemble suits, fire fighter suits, foul weather gear, harnesses, life belts, lifelines, life nets, insulated clothing for "cold test" exposure, supplied air suits, and electrical protective devices).

j. Hearing protective devices.

3.3.5 Center Directors shall:

a. Issue PPE to NASA employees at Government expense in those situations where engineering controls, management controls, or other corrective actions have not reduced the hazard to an acceptable level or where use of engineering controls, management controls, or other techniques is not feasible (Requirement 32282) .

b. Authorize (or deny) the purchase of PPE after the purchase request has been reviewed by safety and health professionals to determine proper specifications and adequacy of abatement.

> *Note: The authority for the purchase of PPE with appropriated funds is provided in 5 U.S.C. 7903, Protective Clothing and Equipment. It is recommended that local safety and health committees be involved in the decision to purchase PPE.*

c. Ensure that only clothing and equipment meeting Federal regulations, industrial standards, or NASA special testing requirements are used for PPE (Requirement 32286) .

> *Note: Transients or visitors may be furnished PPE on a temporary basis if they are on site for NASA-related business purposes or at NASA's invitation.*

d. Ensure that non-NASA, contractor, and non-contractor personnel at their Center procure their own PPE to provide an equivalent level of safety Requirement 32290 .

e. Ensure that non-NASA, contractor, and non-contractor personnel at their Center provide the appropriate training, fit testing, and compliance with other Federal, State, local, and NASA PPE requirements (Requirement).

f. Have a formal Respiratory Protection Program if respirators are used at their Center (Requirement 32294) .

> *Note: The OCHMO at NASA Headquarters provides guidance for purchasing, training, selection, and qualification for use of respiratory protective devices and other health-related PPE.*

3.3.6 COs and COTRs shall ensure that contracts require non-NASA, contractor, and non-contractor personnel to procure their own PPE.

3.3.7 NASA hosts, guides, or area supervisors shall be responsible for obtaining, issuing, and recovering PPE issued to transients or visitors on site for NASA-related business purposes or at NASA's invitation (Requirement 32289) .

3.4 Control of Hazardous Energy (Lockout/Tagout Program)

3.4.1 Requirements for all NASA Centers, facilities, and operations that have the responsibility for controlling hazardous energy involving electrical, pressure, hydraulic, pneumatic, and mechanical systems are given in 29 CFR 1910.147, The Control of Hazardous Energy (lockout/tagout).

3.4.2 Center Directors shall establish a program for controlling hazardous energy during service and maintenance operations where the unexpected energizing or startup of equipment could cause injury to employees or equipment damage (Requirement 32295) .

3.5 Pressure System Safety Requirements for NASA pressure vessel and vacuum system safety are provided in NPD 8710.5, NASA Safety Policy for Pressure Vessels and Pressurized Systems.

3.5.1 Center Directors and Project Managers shall use NPD 8710.5, NASA Safety Policy for Pressure Vessels and Pressurized Systems, to protect personnel and property from hazards posed by pressure vessels and pressurized systems.

> *Note: This document assigns responsibilities for the various aspects of a NASA pressure vessel and pressurized systems safety program, references the codes, standards, guides, and Federal regulations that must be followed, and establishes unique NASA requirements.*

3.6 Electrical Safety

This paragraph provides requirements for protecting personnel and property from electrical hazards. It applies to all NASA uses of electrical power.

3.6.1 Center Directors shall ensure that:

a. Electrical systems are designed in accordance with NFPA 70, National Electric Code, MIL-454, Standard General Requirements for Electronic Equipment, or Center-specific requirements if more specific (Requirement 32297) .

b. Electrical systems are operated and maintained to adequately control hazards likely to cause death or serious physical harm or severe system damage (Requirement 32298).

c. All electrical systems are reviewed by the Center's safety office for appropriate location and for proximity to ignitable or combustible material such as gas, vapor, dust, or fiber Requirement 32322) .

d. All electrical work deemed hazardous by job safety analysis is performed by personnel familiar with electrical code requirements in accordance with NFPA 70E, Standard for Electrical Safety in the Workplace, and qualified/certified for the class of work to be performed Requirement 32300) .

e. Transformer banks or high-voltage equipment (600+ volts) are protected by an enclosure to prevent unauthorized access with metallic enclosures being grounded (Requirement 32305) .

f. Entrances to enclosed transformer banks or high-voltage equipment (600+ volts) not under constant observation are kept locked (Requirement 32306) .

g. Signs warning of high voltage and prohibiting unauthorized entrance are posted at entrances and on the perimeter of enclosed transformer banks or high-voltage equipment (600+ volts) (Requirement 32307) .

h. An authorized access list of qualified personnel is maintained for enclosed transformer banks or high-voltage equipment (600+ volts) (Requirement 32308) .

i. Inductive floors or other methods are used where electrostatic discharge is a significant hazard to personnel or hardware (Requirement 32309) .

3.6.2 Supervisors shall ensure that:

a. No person works alone with high voltage electricity (Requirement 32303).

b. One person, trained to recognize electrical hazards, is delegated to watch the movements of other personnel working with electrical equipment to warn them if they get dangerously close to live conductors or perform unsafe acts and to assist in the event of a mishap (Requirement 32304) .

3.7 Hazardous Material Transportation, Storage, and Use

3.7.1 This paragraph provides requirements for protecting persons and property during the transportation, storage, and use of hazardous materials. NASA policy for transporting hazardous material or hazardous or radiological waste is contained in NPD 6000.1, Transportation Management.

Note: The OCHMO maintains a Web-based hazardous materials information database (ChemWatch) that is available for use by all NASA and NASA contractor personnel. Contact the Senior Environmental Health Officer for Web access to the database on (321) 867-2961.

3.7.2 Requirements for the transport of hazardous materials on both Federal property and public roadways are provided in applicable Federal regulations (e.g., DOT, EPA, and OSHA) and State and local laws and regulations.

3.7.3 Hazardous material is defined by law as a substance or materials in a quantity and form which may pose an unreasonable risk to health and safety or property when transported in commerce (49 CFR Part 171.8, Regulations, Definitions, and Abbreviations). The Secretary of Transportation has developed a list of hazardous materials given in 49 CFR Part 172.101, Purpose and Use of Hazardous Materials Tables.

3.7.4 Typical hazardous materials are those that may be highly reactive, poisonous, explosive, flammable, combustible, corrosive, and radioactive; produce contamination or pollution of the environment; or cause adverse health effects or unsafe conditions.

3.7.5 Transporting Hazardous Material

3.7.5.1 Center Directors shall ensure:

a. That the mode of transportation is inspected to the standards of the Federal Highway Administration, U.S. Coast Guard, Department of Transportation, and Federal Railroad Administration (Requirement 32314) .

b. That all contractor motor vehicles, rail cars, boats, and ships covered by NASA Bill of Lading and used for the transportation of hazardous material have passed an inspection prior to loading to assure that the vehicle or vessel is in safe mechanical condition (Requirement 32313) .

c. That all vehicles transporting hazardous materials on NASA and public roadways display all DOT-required placards, lettering, or numbering (Requirement 32315) .

d. That hazardous material defined in 49 CFR Part 171.8, Hazardous Material Regulations, Definitions, and Abbreviations, is not transported in NASA administrative aircraft (Requirement 32316) .

Note: To ensure hazardous material is not inadvertently loaded on administrative aircraft, all cargo for shipment should be routed through the Center's transportation office or, if en route, cargo should be accepted only

from a certified shipper or freight forwarding agency.

3.7.6 Hazardous Material Storage, Use, and Disposal Inventories

3.7.6.1 Center Directors shall ensure:

a. That hazardous material storage, use, and disposal inventories are conducted at least annually (Requirement).

b. That the conditions of materials in storage are assessed at least quarterly, and those determined to be unsuitable for use are removed from active inventory (Requirement 32317) .

c. That local procedures address the requirements for release prevention, control, countermeasures, contingency planning, and include a listing of restricted/prohibited materials for purchasing and use at Centers.

Note: Requirements for the storage, use, and disposal of hazardous materials are provided in Federal and State regulations.

d. That NASA procurement activities reference 29 CFR Part 1910.1200, Hazard Communication, and Federal Standard 313, Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities, as revised, in commodity specifications, purchase descriptions, purchase orders, contracts, and other purchase documents (Requirement 32318) .

e. That electronic, magnetic, optical, or paper copies of all Material Safety Data Sheets (MSDS) are maintained in the work area where the material is being used or stored (Requirement 32320) .

f. The employees in work areas where hazardous materials are being used or stored are permitted to view any MSDS sheet maintained on file (Requirement).

Note: The NASA MSDS Inventory is accessible at: http://msds.ksc.nasa.gov. 3.7.6.2 Receiving offices at each Center shall provide copies of the MSDS for receipt of such commodities to the central office responsible for maintaining the MSDS records (Requirement 32319).

Note: Safety forms and reports are retained per NPR 1441.1, NASA Records Retention Schedules.

3.8 Hazardous Operations

3.8.1 NASA hazardous operations involve materials or equipment that, if misused or mishandled, have a high potential to result in loss of life, serious injury or illness to personnel, or damage to systems, equipment, or facilities. Adequate preparation and strict adherence to operating procedures can prevent most of these mishaps. This paragraph applies to operations that occur on a routine or continuous basis. Requirements for protecting personnel and property during hazardous test operations are provided in paragraph 3.14 of this NPR.

3.8.2 Center Directors and project managers shall:

a. Identify, assess, analyze, and develop adequate safety controls for all hazardous operations (Requirement 32323) .

b. Ensure that all hazardous operations have a Hazardous Operating Procedure or a

Hazardous Operating Permit (HOP) (Requirement 32324) .

> *Note: HOPs consist of a detailed plan listing step-by-step functions or tasks to be performed on a system or equipment to ensure safe and efficient operations. HOPs list special precautions, start and stop time of the operation, and the approving supervisor(s). Certain operations (e.g., rigging, high voltage) depend on adherence to overall standards and general guidelines and specific training as opposed to HOPs for each specific operation.*

c. Ensure that all HOPs developed at NASA sites or for NASA operations have concurrence from the responsible fire protection or safety office (Requirement).

d. Ensure that all HOPs are approved by the NASA Center safety office or the contractor safety office to assure that a review has been performed (Requirement 32329) .

e. Ensure that requests for relief or changes to HOPs are also approved by the cognizant NASA Center safety office or contractor safety office to assure that a review has been performed (Requirement 32330).

> *Note: If requests for relief or changes to HOPs are approved by the contractor's safety office, a copy should be forwarded to the local NASA safety office for informational purposes.*

f. Ensure facility operating instructions and changes are developed based on the facility mission and operational requirements (Requirement 32504) .

g. Ensure that all procedures include sufficient detail to identify residual hazards and cautions to NASA personnel (Requirement 32505) .

h. Ensure that hazardous procedures are marked conspicuously on the title page; e.g., "THIS DOCUMENT CONTAINS HAZARDOUS OPERATIONS PROCEDURES," to alert operators that strict adherence to the procedural steps and safety and health precautions contained therein is required to ensure the safety and health of personnel and equipment (Requirement 32328) .

i. Ensure that specific personnel certification requirements are established, as listed in Chapter 7, in cases where hazardous operations (e.g., rigging, high voltage) depend on adherence to specific standards, guidelines, and training (Requirement 32325) .

j. Ensure that personnel other than certified operators are excluded from exposure to hazardous operations that depend on adherence to specific standards, guidelines, and training (Requirement 32326) .

k. Ensure that personnel use the buddy system whereby an adjacent or nearby person not directly exposed to the hazard serves as an observer to render assistance where the risk of injury is high (Requirement 32327) .

3.8.3 Center SMA Directors or their designee shall review and approve HOPs (Requirement).

3.9 Laboratory Hazards

3.9.1 This paragraph provides guidance for protecting personnel and property in a laboratory environment. For the purposes of this document, a laboratory is a facility in which experimentation, testing, and analyses are performed on human or animal

subjects, organisms, biological and other physical materials, substances, and equipment (including bioinstrumentation). Included also are certain equipment, repair, and calibration operations and processing of materials.

3.9.2 Center Directors and project managers shall ensure that:

a. The design of laboratories incorporates the requirements of State and Federal codes required for the individual Center (e.g., building, electrical, and fire protection for laboratory facilities) (Requirement).

b. Escape routes are provided, designed, and marked in accordance with the NFPA 101, Life Safety Code (Requirement 32333) .

c. Occupational safety and health considerations such as ventilation, shower stalls, and eye wash stations are included in the design of laboratories (Requirement 32334) .

> *Note: For facility acquisition and construction safety requirements, see Chapter 8.*

d. The design, fabrication, or modification of laboratories used for experimentation, testing, or analyses performed on human or animal subjects are coordinated in advance with OCHMO at (202) 358-2390 (Requirement).

e. Laboratory facilities and areas with significant quantities of flammable, combustible, corrosive, and toxic liquids, solids, or gases are protected in accordance with provisions of NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals, as modified below (Requirement 32335) .

f. Laboratories not using or fitting the above chemical classification, yet housing unique, mission-critical, or high-value research equipment, conform to the provisions of NASA-STD 8719.11, Safety Standard for Fire Protection (Requirement 32336) .

> *Note: In the design of laboratories, special facilities should be considered to ensure the integrity of the terrestrial environment as well as the integrity of biological and physical samples returned from space.*

g. Laboratory designs include additional considerations for biohazards resulting from use or handling of biological materials such as infectious microorganisms, viruses, medical waste, or genetically engineered organisms (Requirement 32338)

> *Note: See 29 Part CFR 1910.1030, Blood Borne Pathogens, and NPR 1800.1, NASA Occupational Health Program Procedures, for additional details.*

h. Laboratory designs include additional considerations to protect physical samples returned from space against terrestrial contamination and to protect the terrestrial environment against potential biological or toxic hazards due to these samples (Requirement).

3.9.3 Chemical and Hazardous Materials

In addition to pertinent safety requirements found elsewhere in this document, the following requirements are specifically applicable to laboratories.

3.9.3.1 Center Directors and project managers shall ensure that:

a. Laboratories meeting the definition as described in 29 CFR Part 1910.1450,

Occupational Exposure to Hazardous Chemicals in Laboratories, are operated in accordance with chemical hygiene plans (Requirement 32340) .

b. Suitable facilities for quick drenching or flushing of the eyes and body of any person exposed to injurious corrosive materials are provided within the work area for immediate emergency use (Requirement 32341) .

c. Installation, maintenance, and access to facilities for quick drenching and flushing of the eyes and safety showers are in accordance with ANSI 358.1, Emergency Eyewash and Shower Equipment, latest edition (Requirement 32342) .

d. Eyewashes and/or safety showers are located no more than 10 seconds or 50 feet distance away from the hazard source (Requirement 32343) .

3.9.4 Solar Simulators

3.9.4.1 Center Directors and project managers shall ensure that all personnel wear skin and eye protection while in direct view of a bare pressurized arc lamp, whether energized or not, unless the system is locked out or tagged out for maintenance or repair (Requirement 32344) .

3.9.5 Ventilation

3.9.5.1 Policy and requirements for ventilation systems are provided in NPR 1800.1, NASA Occupational Health Program Procedures.

3.9.5.2 Center Directors shall ensure that their occupational health programs assure proper ventilation (Requirement).

3.9.6 Glassware

Because some laboratory operations use a considerable amount of glassware and ceramics, necessary safeguards shall be employed to minimize personnel injury. Refer to the Guide for Safety in the Chemical Laboratory, Manufacturing Chemists' Association, Inc., and Handling Glassware.

3.10 Lifting Safety

3.10.1 Center Directors and project managers shall comply with NASA-STD-8719.9, Standard for Lifting Devices and Equipment, for protecting persons and property during lifting operations (Requirement 25150) .

> *Note: This standard establishes minimum safety requirements for the design, testing, inspection, personnel certification, maintenance, and use of overhead and gantry cranes, mobile cranes, derricks, hoists, special hoist-supported personnel lifting devices, hydrasets, hooks, mobile aerial platforms, power industrial trucks, jacks, and slings for NASA-owned and NASA contractor-supplied equipment used in support of NASA operations at NASA Centers.*

3.11 Explosive, Propellant, and Pyrotechnic Safety

3.11.1 Center Directors and project managers shall use NASA-STD-8719.12, Safety Standard for Explosives, Propellants, and Pyrotechnics, for protecting personnel and property from hazards of explosives and explosive materials, including all types of explosives, propellants (liquid and solid), oxidizers, and pyrotechnics (Requirement

25151) .

3.11.2 Center Directors and project managers shall ensure that explosive, propellant, and pyrotechnic operations are conducted in a manner that exposes the minimum number of people to the smallest quantity of explosives for the shortest period consistent with the operation being conducted (Requirement 32349) .

3.11.3 Center Directors shall designate in writing an Explosive Safety Officer (ESO) for explosives, propellant, and pyrotechnic operations at their Center (Requirement 32350) .

> *Note: The Center SMA Director may recommend a candidate for Center ESO, if requested by the Center Director. For specific responsibilities of the ESO, refer to NASA-STD-8719.12, Safety Standard for Explosives, Propellants, and Pyrotechnics.*

3.11.4 The ESO shall:

a. Manage the Center Explosives, Propellants, and Pyrotechnic Safety Program to assure a robust mishap prevention program is in place (Requirement).

b. Ensure that the Explosives, Propellants, and Pyrotechnic Safety Program meets all Federal, NASA, State, and local requirements (Requirement).

c. Represent the Center Director in this program to help assure that minimum number of required personnel and critical resources are exposed to the minimum amount of explosives for the minimal amount of time for all explosive operations (Requirement).

d. Advise the Center Director on the programmatic health of the Explosives, Propellants, and Pyrotechnic Safety Program (Requirement).

e. Represent the Center Director for all explosives, propellants, and pyrotechnic safety matters (Requirement).

f. Assure oversight of all processes required by NASA-STD-8719.12, Safety Standard for Explosives, Propellants, and Pyrotechnics (Requirement).

g. Review all operating procedures for handling explosives, propellants, and pyrotechnics (Requirement).

h. Review and participate in the development of construction and/or modification plans for facilities or structures containing explosives, propellants, and pyrotechnics (Requirement).

i. Review all locations and routes that provide for the transportation, storage, and handling of explosives, propellants, and pyrotechnic materials (Requirement).

j. Provide oversight for staff training and records and participate in the evaluation of selected training programs for explosive, propellant, and pyrotechnic safety (Requirement).

> *Note: Safety forms and reports are retained per NPR 1441.1, NASA Records Retention Schedules.*

k. Process and provide inputs for the approval of all explosive-related site plans and review current explosive site plans on an annual basis (Requirement).

l. Assist in processing requests for relief in accordance with NASA-STD 8709.20

(Requirement).

m. Validate, approve, and sign all explosive licenses (Requirement).

Note: As defined in NASA-STD8719.12, Safety Standard for Explosives, Propellants, and Pyrotechnics: Licensed Explosive Locations - Ammunition and explosive storage locations (not for explosive operations and excluding Hazard Division 1.1 & 1.2), which are normally outside the Center's explosive storage area but within NASA's area of control.

n. Review all Memorandums of Agreement associated with explosive, propellant, and pyrotechnic operations (Requirement).

Note: If the ESO represents NASA as a tenant organization, the ESO assures compliance with the host requirements though formal negotiations and documentation of those agreements. If the ESO represents NASA as the Host, the ESO assures compliance with all appropriate elements of this NPR. In all cases, the ESO assures that agreements are formalized to maximize the health and safety of NASA employees and facilities.

o. Perform an independent hazard assessment of all laboratories and test facilities having activities that involve the mixing, blending, extruding, synthesizing, assembling, disassembling and other activities involved in the making of a chemical compound, mixture, or device which is intended to explode (Requirement).

3.11.5 Explosives, electro-explosive devices (EEDs), electrically initiated devices (EIDs), NASA Standard Initiators (NSIs), and other devices are susceptible to unintentional ignition by many forms of direct or induced electrical energy including electromagnetic radiation (EMR) from ground and airborne emitters (radio frequency communication devices).

3.11.5.1 Center Directors shall ensure that the local radio frequency (RF) environments are characterized as a first step before situating pyrotechnic devices at any location to ensure RF levels are within the limits specified for the device as defined in NASA-STD-8719.12, Paragraph 5.13.5 (Requirement).

3.11.5.2 Center Directors shall ensure that the requirements of NASA-STD-8719.12, Safety Standard for Explosives, Propellants, and Pyrotechnics, Paragraph 5.13.5, are applied to all classes of equipment that may contain RF emitting devices (intentional and unintentional), including: Ground Support Equipment (GSE); Ground Support Systems (GSS); Facility Support Systems (FSS); other institutional equipment and devices; and personal devices (Requirement).

Note: Types of RF emitting devices include, but are not limited to: cellular phones; answer-back pagers; portable computers and personal data assistants with wireless capability; wireless network access points; fixed, mobile, and portable radio transceivers; remote key fobs; RF laboratory and test equipment; RF surveillance and ranging devices; X-ray machines; IR ovens; wireless audio, video, and other information transmission systems; RFID readers and tags; and pulsed transmitters and radar systems.

3.11.5.3 Center Directors shall ensure that when there is a need (including emergency operations) to use an intentional or unintentional RF emitting device at an explosive operating location, explosive location, or explosive facility, only those RF emitting devices that meet and are tagged as meeting the requirements of NASA-STD-8719.12,

Safety Standard for Explosives, Propellants, and Pyrotechnics, Section 5.13.5, are used.

Note that similar or identical appearing devices may have differing transmitting capabilities (either frequency or power).

3.12 Underwater Operations Safety

3.12.1 Requirements for open-water operations are given in NPR 1800.1, NASA Occupational Health Program Procedures.

3.12.2 Center Directors and project managers shall use NSS/WS 1740.10, NASA Safety Standard for Underwater Facility and Non-Open Water Operations, as the minimum standard to establish the safety requirements for all NASA neutral buoyancy facilities, equipment, personnel, and operations involving underwater activities including the simulation of a weightless environment (Requirement 25152) .

Note: This standard also applies to NASA personnel participating in underwater operations at non-NASA facilities.

3.13 Launch, Entry, and Experimental Aeronautical Vehicle Operations Safety

3.13.1 This paragraph provides policy and requirements for protecting the safety of the public, the workforce, and assets during operations involving space launch or entry vehicles or experimental aeronautical vehicles (EAV) and their associated payloads. These vehicles include, but are not limited to, reusable launch vehicles, Expendable Launch Vehicles (ELVs), experimental aerospace vehicles, entry vehicles, sample return capsules, uninhabited aerial vehicles, balloons, sounding rockets, and drones.

Note: This paragraph does not apply to conventional piloted aircraft. See Chapter 4, Aviation Safety, of this NPR.

3.13.2 The Chief, Safety and Mission Assurance, shall:

a. Establish and oversee the Agency Safety Operations Program elements needed to assure successful implementation of operations safety requirements and assure related concerns are evaluated and resolved (Requirement).

b. Approve and promulgate Agency-level operations safety policy and requirements, including the provisions of this NPR and associated implementation documents (Requirement).

c. Designate Agency safety representatives needed to:

(1) Monitor preparations for operations to determine compliance with Agency safety policies, processes, and requirements (Requirement).

(2) Support programs/projects to provide advice and technical support, and act as a link to independent engineering, safety, and assessment capabilities (Requirement).

(3) Maintain cognizance over safety issues that have the potential to be elevated to NASA Headquarters for resolution (Requirement).

(4) Provide a concurrence or nonconcurrence on the safety readiness to begin operations when the decision is elevated to NASA Headquarters (Requirement 32347) .

(5) Participate prior to and during operations to communicate the Agency safety position

to appropriate program/project officials (Requirement 32348) .

3.13.3 Range Safety

3.13.3.1 NPR 8715.5, Range Safety Program, contains NASA's range safety policy, roles and responsibilities, requirements, and procedures for protecting the safety of the public, the workforce, and property during range flight operations. These operations include the launch or entry of an orbital, suborbital, or deep space vehicle or operation of an experimental aeronautical vehicle. NPR 8715.5, Range Safety Program, defines the range safety-related roles and responsibilities for all levels of NASA management, including the Agency Range Safety Manager. NPR 8715.5, Range Safety Program, also incorporates NASA's public risk acceptability policy for range flight operations.

3.13.4 Payload Safety

3.13.4.1 Payload Safety Policy. It is NASA policy to safeguard people and resources (including flight hardware and facilities) from hazards associated with payloads controlled by NASA and hazards associated with payload-related Ground Support Equipment (GSE) by eliminating the hazards or reducing the risk associated with the hazard to an acceptable level. To accomplish this policy

NASA shall:

a. Establish and maintain technical and procedural safety requirements applicable to the design, production, flight-area processing and testing, vehicle integration, flight, and planned recovery of NASA payloads.

b. Coordinate with U.S. or foreign entities that participate in NASA payload projects as needed to ensure compliance with all safety requirements that apply to each payload.

c. Incorporate all applicable safety requirements into the overall requirements for each NASA payload, the contracts for any related procurements, and any related cooperative or grant agreements.

d. Maintain an independent payload safety review and approval process designed to ensure that each NASA payload project properly implements all applicable safety requirements and to facilitate safety risk management appropriate to each payload.

3.13.4.2 Manned Space Flight Payloads. For payloads that will fly on, or interface with, a manned space launch vehicle, spacecraft, or entry vehicle controlled by NASA, Center Directors and program/project managers shall establish the processes and requirements needed to satisfy Paragraph 3.13.4.1 of this NPR (Requirement).

For example: Space Shuttle payloads are subject to NSTS 1700.7, Safety Policy and Requirements for Payloads Using the Space Transportation System; NSTS/ISS 13830, Payload Safety Review and Data Submittal Requirements for Payloads Using the Space Shuttle and International Space Station; and KHB 1700.7, Space Shuttle Payload Ground Safety Handbook.

3.13.4.3 Unmanned Suborbital Payloads. For a payload that will fly on an unmanned suborbital vehicle controlled by NASA (such as a sounding rocket, balloon, or experimental aeronautical vehicle), Center Directors and program/project managers shall establish the processes and requirements needed to satisfy Paragraph 3.13.4.1 of this NPR (Requirement).

For example: The Wallops Flight Facility Range Safety Manual applies to

Wallops-controlled suborbital payloads.

3.13.4.4 Return-to-Earth Payloads. For a payload that will be launched into space and will return to Earth for recovery or purposes other than disposal, Center Directors and program/project managers shall establish the processes and requirements needed to satisfy Paragraph 3.13.4.1 of this NPR for the recovery aspects of the mission (Requirement).

Note: Disposal of space flight hardware is covered by the NASA Orbital Debris Program. See paragraph 3.13.6 of this NPR.

3.13.4.5 ELV Payloads. OSMA has established a safety program designed to ensure

that Paragraph 3.13.4.1 of this NPR is satisfied for payload missions that will fly on ELVs. The associated responsibilities and requirements are provided in NPR 8715.7, Expendable Launch Vehicle Payload Safety Program.

3.13.4.5.1 Reserved.

a. Reserved.

b. Reserved.

c. Reserved.

d. Reserved.

3.13.4.5.2 Reserved.

a. Reserved.

b. Reserved..

c. Reserved.

d. Reserved.

e. Reserved.

f. Reserved.

g. Reserved.

h. Reserved.

i. Reserved.

j. Reserved.

k. Reserved.

l. Reserved.

m. Reserved.

n. Reserved.

3.13.4.5.3 Reserved.

a. Reserved.

b. Reserved.

c. Reserved.

d. Reserved.

e. Reserved.

f. Reserved.

g. Reserved.

3.13.4.5.4

a. Reserved.

b. Reserved.

c. Reserved.

3.13.4.5.5 Reserved.

a. Reserved.

b. Reserved.

c. Reserved.

3.13.4.5.6 Reserved.

3.13.5 Commercial Launch and Entry Operations

Chapter 2 of NPR 8715.5, Range Safety Program, contains policy and requirements applicable to NASA missions that involve the use of commercially-available space launch or entry services. Also see NASA-STD-8709.2, NASA Safety and Mission Assurance Roles and Responsibilities for Expendable Launch Vehicle Services.

3.13.6 Orbital Debris Safety

Safety policies, regulations, processes, and requirements that apply to the disposal of spaceflight hardware at the end of a mission are contained in NPR 8715.6, NASA Procedural Requirements for Limiting Orbital Debris, and NASA-STD 8719.14, Process for limiting Orbital Debris. Additional information about limiting orbital debris can be found in NASA-Handbook 8719.14, Handbook for Limiting Orbital Debris.

3.14 Test Operations Safety

3.14.1 This paragraph provides requirements for protecting personnel and property during test operations, for both human-controlled and unoccupied or robotic tests. Testing includes hazardous training activities and demonstrations of test hardware or procedures. The requirements stated herein apply to test facilities; test equipment located within, or attached to, test facilities; equipment being tested; test personnel; test conduct; and test documents.

3.14.2 Center Directors and project managers shall ensure that test plans are developed and evaluated to assure test performance within safe operating limits (Requirement 25163) .

Note: Evaluations will address the test article, test facility, testing

procedures, test conditions, operator involvement, and potential risk to adjoining facilities and personnel.

3.14.3 Safety Documentation

3.14.3.1 Safety documentation establishes the basis for safe test conduct by means of engineering analyses (including hazard analyses).

3.14.3.2 Center Directors and project managers shall ensure that established test controls are clearly identified in test drawings, facility drawings, and test procedures (Requirement).

3.14.4 Test System Requirements

3.14.4.1 Project managers responsible for developing test systems shall:

a. Design test systems such that test personnel or critical test hardware are not subjected to a test environment wherein a credible single-point failure (e.g., power loss) could result in injury, illness, or loss to the critical test hardware (Requirement 32372) .

b. Construct all systems (electrical, mechanical, pneumatic, and/or hydraulic) so that no single failure could cause a critical condition (Requirement 32373) .

c. Ensure that software that may interface with test systems meets the requirements stated in Chapter 1 of this NPR (Requirement 32374) .

Note: Software by itself is not hazardous; however, when interfaced with test hardware, software could command a hazardous condition in the hardware. See NASA-STD-8719.13, Software Safety Standard, for further information.

d. Calibrate and certify safety-critical instrumentation before test operations and as required by test documentation or the test organization's internal procedures (Requirement 32375) .

e. Ensure all personnel involved in tests are informed of potential hazards, safety procedures, and protective measures (Requirement 32376) .

f. Ensure the availability of appropriate emergency medical treatment facilities (Requirement 32376) .

g. Conduct formal reviews of engineering designs that are complicated or potentially hazardous to facilities (Requirement 32378) .

h. Ensure test result reports include anomalies, safety implications, and lessons learned (Requirement 32379) .

3.14.5 Test Readiness Review

3.14.5.1 Center Directors and project managers shall ensure that Test Readiness Reviews:

a. Are conducted for tests involving new or modified hardware and/or procedures (Requirement).

b. Determine and document the safety, technical, and operational readiness of the test (Requirement 32381) .

3.14.6 Pre-test Meeting

3.14.6.1 Center Directors and project managers shall ensure that a pre-test meeting is conducted with all involved personnel to discuss the facility, design, instrumentation, safety, and operator training and certification (Requirement 32382) .

Note: The meeting should also establish the test plan, identify test constraints to ensure facility safety, and determine test article readiness, ground support equipment readiness, and procedural readiness.

3.14.7 Human Research Subjects

3.14.7.1 The requirements for the protection of human research subjects are contained in NPD 7100.8, Protection of Human Research Subjects, and 45 CFR Part 46, Protection of Human Subjects.

3.14.7.2 Center Directors and project managers shall ensure that:

a. Tests involving hazardous substances, where human test subjects or test team personnel may be exposed, are reviewed for adequacy of test team safeguards, including direct communication between the test subjects and test conductors (Requirement 32383) .

b. A facility environmental control system failure or failure in the distribution system affecting one pressure-suited occupant shall not affect any other pressure-suited occupant for tests requiring crew participation in a pressure suit (Requirement 32384) .

c. A means exists for immediately detecting an incipient fire or other hazardous condition in each crew compartment of any test area (Requirement 32385) .

d. Automatic fire detection is provided for critical areas not suitable for visual monitoring (Requirement 32386) .

e. Crewed test systems are designed for timely and unencumbered rescue of incapacitated crew members (Requirement 32387) .

f. Software controlling crewed test systems are thoroughly analyzed to ensure that no command results in death or injury to the test subjects (Requirement 32388) .

Note: Policies and requirements for software are given in NPD 2820.1, NASA Software Policy, and NPR 7150.2, NASA Software Engineering Requirements.

g. Crewed test systems are designed to provide for manual overrides of critical software commands to ensure the safety of test subjects during any system event or test scenario (normal operation, malfunction, emergency) (Requirement 32389)

. h. Manual overrides of critical software commands support safe test termination and egress of test subjects (Requirement 32390) .

i. Medical resources and facilities needed for response are alerted, on-call, and immediately available as needed (Requirement 32391 .

3.15 Non-Ionizing Radiation

3.15.1 Requirements for non-ionizing radiation are provided NPR 1800.1, NASA Occupational Health Program Procedures. Microwave and radar protection standards

are covered in various State regulations, national consensus standards, and Federal standards including 29 CFR Part 1910.97, Non-ionizing Radiation. This paragraph provides requirements for protecting personnel and property during laser use in NASA operations. The primary laser hazard to humans is eye and/or skin damage from direct exposure to the beam or specular reflection, and in some cases, from viewing a diffuse reflection.

3.15.2 Exposure requirements for laser radiation are provided in 21 CFR Part 1040, Performance Standards For Light-Emitting Products. Requirements for the procurement and manufacture of laser products are provided in 21 CFR Part 1040.10, Laser Products, and 21 CFR Part 1040.11, Specific Purpose Laser Products.

3.15.3 Center Directors and project managers shall comply with these regulations unless a specific exemption is obtained from the U.S. Department of Health and Human Services, Food and Drug Administration (Requirement 32398) .

3.15.4 Center Directors and project managers shall ensure that:

a. Only trained and certified employees are assigned to install, adjust, and operate laser equipment (Requirement 25168) .

b. Personnel operating lasers are trained and certified in accordance with Chapter 7 of this NPR (Requirement 32423) .

c. Laser operations during any open-air laser scenario conducted on DoD-controlled ranges or test facilities or by DoD personnel use the Range Commanders Council Document 316-91, Laser Range Safety (Requirement 25165) .

d. Laser operation conforms to the principles and requirements set forth in ANSI

Z136.1, American National Standard for Safe Use of Laser, and ANSI Z136.2, Safe Use of Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources (Requirement 32399) .

e. Exposure of personnel to laser radiation does not exceed the permissible exposure levels provided in ANSI Z136.1, American National Standard for Safe Use of Laser (Requirement 32395) .

f. To the maximum extent practicable, laser hazards to personnel are eliminated by engineering design before they become operational, or procedures are developed and equipment provided to reduce the risk for those hazards that cannot be eliminated (Requirement 32396)

g. Any laser that can cause injury or damage has a Center-approved safety documentation, test plan, and test procedure review (Requirement 32400) .

3.15.5 Laser Radiation Safety Officer

3.15.5.1 The Center SMA Director shall designate a qualified Laser Radiation Safety Officer for their site (Requirement).

3.15.5.2 The Laser Radiation Safety Officer shall:

a. Contact the laser safety clearing house to obtain a "Site Window" clearance where a planned laser operation has the potential for the beam to strike an orbiting craft (Requirement 32401) .

Note: Clearance is obtained from the Orbital Safety Officer, U.S. Space Command / J3SOO, 1 NORAD Road, Suite 9-101, Cheyenne Mountain AFB, CO 80914-6020, Stop 4, Phone: (719) 474-3056/4404/4444.

b. Review procedures for all tests that use lasers (Requirement 32402) .

c. Be on site to monitor all laser tests (Requirement 32403) .

3.15.6 Ground Operations Using Class III-B and IV Lasers

3.15.6.1 Class III-B and IV laser users shall:

a. Operate Class III-B and IV lasers only in controlled environments or designated areas that have no unintended reflective or transmitting surfaces (Requirement 32404) .

b. Post laser operations areas with standard warning placards as set forth in ANSI Z136.1, American National Standard for Safe Use of Lasers (Requirement).

c. Ensure that the posted area is isolated to prevent inadvertent entry (Requirement 32405) .

d. Wear laser goggles or other approved methods of eye protection in accordance with requirements of ANSI Z136.1, American National Standard for Safe Use of Lasers (Requirement 32406) .

e. Keep all flammable materials/vapors away from any laser during operation unless specifically authorized by the operation/test plan (Requirement 32407) .

3.15.7 Airborne Operations Using Class III-B and IV Lasers

3.15.7.1 Project managers shall:

a. Identify the airborne use of Class III-B and IV lasers early in the system acquisition process and track their use throughout the program life cycle (Requirement 32409) .

Note: A realistic and timely application of safety engineering to laser systems can avoid or reduce the costs involved in redesign, time lost in modification, and loss of mission capability.

b. Ensure the design of laser systems for NASA aircraft and spacecraft includes a system of interlocks to prevent inadvertent laser beam output (Requirement 32411) .

c. When a test circuit switch is provided to override the ground interlock to aid ground test operations, maintenance, or service, ensure the design precludes inadvertent operation (Requirement 32412) .

d. Ensure that the crew will not operate the laser except in accordance with the prescribed mission profile (Requirement 32413) .

e. For long-range laser shots, designate as large an exclusion area as practical to minimize the risk to the people outside the area (Requirement 32415) .

Note: A buffer area should be added around the exclusion area. Air Force AFOSH Standard 48-12, Health Hazard Control for Laser Operations, includes a guide for operation of lasers from aircraft. It can be used to develop the buffer zone for space-based laser shots directed at the ground. (See Range Commanders Council (RCC) Document 316-91, Laser Range

Safety.)

f. Ensure a hazard evaluation and written safety precautions are completed prior to airborne laser operations (Requirement 32416) .

g. Ensure that the hazard analysis considers catastrophic events and the need for very reliable, high-speed laser shutdown should such events occur (Requirement 32417) .

Note: See ANSI Z136.1, American National Standard for Safe Use of Lasers, for hazard evaluation and control information.

h. Ensure that qualified personnel perform laser hazard evaluations to determine specific hazards associated with specific uses, establish appropriate hazard control measures, and identify crew and public-at-large protection requirements (Requirement 32418) . i. When completing the hazard evaluation, consider and document the atmospheric effects of laser beam propagation, the transmission of laser radiation through intervening materials, the use of optical viewing aids, and resultant hazards; e.g., electrical, cryogenic, toxic vapors (Requirement 32419) .

3.15.7.2 The Pilot-in-Command shall ensure that the laser system is used in accordance with the test plan (Requirement 32414) .

3.15.7.3 Program managers and safety evaluators shall assess the safety aspects, compliance with safety requirements, and resolution of laser safety-related problems (Requirement 32410) .

3.15.8 Laser Software

3.15.8.1 Project managers shall ensure that:

a. Laser software provides safety precautions for fast-moving lasers and prevents misdirected laser operation (Requirement 32420) .

b. Laser software development is subjected to a software safety analysis per Chapter 1 of this NPR (Requirement 32421) .

c. Existing laser software systems are reviewed to assure that safety precautions are provided (Requirement 32422) .

Note: See NASA-STD-8719.13, Software Safety Standard, for further information.

3.16 Ionizing Radiation

Policies and requirements for the handling, use, and storage of radioactive material and radiation generating equipment are contained in directives under the purview of the occupational health organizations. See NPD 1800.2, NASA Occupational Health Program.

3.17 Confined Spaces

3.17.1 Requirements for operations in confined spaces are provided in OSHA 29 CFR Part 1910.146, Permit-Required Confined Spaces.

3.17.2 A confined space is any space that exhibits all three of the following characteristics: large enough to bodily enter and perform work, not designed for continuous human occupancy, and limited means of entry or exit. A permit-required

confined space is a confined space that contains any recognized serious safety or health hazard. No entry into permit-required confined spaces will be made until an assessment of that space has been made and a permit or operating procedures are posted.

3.17.3 Center Directors shall develop and document a confined space operations plan that, at a minimum, establishes a confined space working group, outlines the confined space permit process, and identifies all confined spaces on their Center (Requirement).

3.17.4 Center Directors and project managers shall ensure that:

a. Entry into Permit-Required Confined Spaces is performed with written procedures and authorizations (Requirement 32424) .

b. No entry into confined spaces is made until an assessment of that space has been made and a permit or operating procedures posted (Requirement 32425) .

c. All contractors or persons performing work on the Center are notified of all confined spaces (Requirement).

3.17.5 Supervisors shall have the overall responsibility for entry and work in confined spaces and ensure compliance with ANSI Z117.1, Safety Requirements for Confined Space, and the NIOSH Publication No. 87-113, A Guide to Safety in Confined Spaces (Requirement 32426) .

> *Note: Permit requirements for confined spaces are given in 29 CFR 1910.146, Permit-required confined spaces.*

3.18 Fall Protection on Elevated Structures

3.18.1 It is NASA’s policy to provide fall protection for any walking working surface where a person is exposed to a fall to a lower level. Fall protection programs shall focus on eliminating, mitigating, and/or controlling the fall hazard before an individual is exposed to the hazard (Requirement).

a. Fall protection programs shall protect workers who may be exposed to a fall of four feet or greater to a lower level for general industry activities in accordance with 29 CFR 1910 and six feet or greater to a lower level for construction activities in accordance with 29 CFR 1926 (Requirement).

b. "Fall hazards” from any height to lower level shall require protection if the work is over a collateral hazard (e.g. moving machinery, chemicals, electrical hazards, impalement hazards) (Requirement).

> *Note: OSHA requirements for fall protection can be found in 29 CFR 1910, General Industry, and 29 CFR 1926, Construction Industry. The fall protection requirements in this NPR do not repeat, replace, or limit OSHA requirements or NASA or contractor safety programs requirements, except where these requirements are more stringent.*

3.18.2. All waivers to requirements listed in paragraph 3.18 shall be documented in the Center’s fall protection implementation plan after submission of requests to waive/deviate per paragraph 1.13 of this document (Requirement).

3.18.3 Each Center Director shall implement a Center fall protection program to protect all Government employees, contractors, subcontractors, international partners, and persons who are exposed to falls at onsite facilities through the course of their work

(Requirement).

a. NASA Center Directors should evaluate the feasibility of establishing a standard fall protection height of four feet for all work at heights, to lessen the harmful impact to worker resulting from a fall to a lower level.

b. The Center Director shall ensure that the Center's fall protection program complies with the requirements of 29 CFR 1910, General Industry, and 29 CFR 1926, Construction Industry; utilizes as guidelines (these versions), ANSI/ASSE Z359, Fall Protection Code series (Z359.0-2007, Z359.1-2007, Z359.2-2007, Z359.3-2007, and Z359.4-2007); and complies with any more stringent requirements necessary for the Center's specific fall hazards (Requirement).

c. The Center Director shall designate, in writing, a Center Fall Protection Program Administrator who is responsible for the development, implementation, and management of the Center's fall protection program (Requirement).

Note: The Center Director may designate a committee to assist the Center Fall Protection Program Administrator in complying with this NPR.

d. The Center Director shall ensure that the designated Center Fall Protection Program Administrator and/or team has a working knowledge of current fall protection regulations, standards, and fall protection equipment and systems and the skills, experience, and abilities to effectively manage the Center's fall protection program (Requirement).

3.18.4 The Center Fall Protection Program Administrator shall:

a. Implement and coordinate the Center's fall protection program (Requirement).

b. Evaluate the Center-wide hazards, determine where protection from falls from elevation is required, and establish any additional, more stringent requirements necessary to protect against Center-specific fall hazards (Requirement).

c. Provide guidance and oversight to ensure that NASA fall protection requirements are included in contracts where contractor employees of the acquisition will be working in situations that require fall protection (see paragraph 3.18.1) (Requirement).

d. Provide oversight to ensure that NASA fall protection requirements are included in work instructions where individuals will be working in situations that require fall protection (see paragraph 3.18.1) (Requirement).

e. Provide oversight to ensure that anyone who is identified as a qualified person (per ANSI/ASSE Z359.0-2007, paragraph 2.109) to serve as a subject matter expert in support of the Center's fall protection program has an engineering degree or access to a person with an engineering degree to identify and to evaluate unique situations and “non-standard equipment” and has been trained by an industry-recognized trainer, NASA-recognized trainer/training center, or NASA-developed training program equivalent to ANSI and OSHA compliant training (Requirement).

f. Provide oversight to ensure that, for each situation that requires fall protection at the Center (see paragraph 3.18.1) (NASA or contractor led), there is a competent person (per ANSI/ASSE Z359.0-2007, paragraph 2.27) assigned responsibility for the immediate application of fall protection work where fall protection is required whose education and training has been administered by an industry-recognized trainer, NASA-recognized trainer/training center, or NASA-developed training program

equivalent to ANSI and OSHA compliant training (Requirement).

g. Remain current with changing OSHA and ANSI fall protection requirements, this NPR, local laws, and new fall protection systems (Requirement).

h. Conduct an annual review and audit of the Center's fall protection program to ensure compliance (Requirement). Use of new technology, regulations, and industry practices should be considered during the annual review and audit.

3.18.5 Supervisors shall:

a. Ensure that NASA fall protection requirements are included in work instructions where NASA employees and/or contractors will be working in situations that require fall protection (see paragraph 3.18.1) (Requirement).

| TOC | ChangeLog | Preface | Chapter1 | Chapter2 | Chapter3 | Chapter4 | Chapter5 | Chapter6 | Chapter7 | Chapter8 | Chapter9 | Chapter10 | Chapter11 | AppendixA | AppendixB | AppendixC | AppendixD | AppendixE | AppendixF | AppendixG | AppendixH | AppendixI | ALL |

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